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# CONCENTRATED SWEETENED CREAM—A SIMPLE AND ECONOMICAL METHOD OF PRESERVING MILK-FAT

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## INTRODUCTION

EVERY major milk-producing country has a milk-surplus problem, especially during the season of greatest production. As a consequence, milk has to be converted into a more stable form for preservation. This involves the expense of processing, and of storage under special packaging and temperature conditions. An example is frozen cream. The amount in storage in the United States in recent years has ranged from 6 million to 26 million lb.

Preservation with sugar (sucrose) is also practised, as in the making of sweetened condensed milk, a product that contains approximately 44% sucrose or 62% in the water phase in order to prevent fermentation. In this form milk solids can be shipped without refrigeration not only within a country but also throughout the world without serious deterioration in flavour or other desirable properties. However, since the fat content is low—the minimum requirement in the United States is 8.5%—this product is not an economical form in which to ship milk-fat long distances.

Numerous variations of preservation methods can be visualized. A new one is exemplified in concentrated sweetened cream—a pasteurized mixture of high-fat cream, sucrose and milk solids-not-fat (s.n.f.). Tamsma & Bell (1) showed that suitable formulation will yield a milk product that contains 40% milk-fat, 31% sucrose, 19% water and 10% s.n.f. While the sucrose in the water phase is 62%, the percentage of sucrose in the product is much less than in sweetened condensed milk. For some manufacturers and users this proportion of components may be best; for others it may not be.

## FORMULATION AND MANUFACTURE OF CONCENTRATED SWEETENED CREAM

Like sweetened condensed milk, concentrated sweetened cream should preferably have a smooth, free-flowing body, but it should be viscous enough to retain its

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homogeneity during storage. In making the former product, manufacturers are guided by minimum composition standards, and as a matter of good business they adhere closely to these requirements. With the composition standardized, other means besides variation in the components are employed to obtain the desired viscosity and to prevent age-thickening, such as the milk forewarming conditions, method and time of adding the sucrose and the rate of cooling after the condensing operation.

Experience with the problem of age-thickening in sweetened condensed milk indicates that the minimum standards for milk-fat and total milk solids are near the maximum levels if age-thickening is to be avoided. Therefore, if more milk-fat per unit of product is to be preserved by dissolving the necessary amount of sucrose in the water phase, the ratio of milk fat to s.n.f. as it occurs in milk is not suitable; the ratio must be changed so that there is less s.n.f. in proportion to the fat.

If the primary purpose of the product is to preserve milk-fat, formulation can be such as to yield a concentrated sweetened cream that contains nearly 7 times as much fat as sweetened condensed milk. (Such a formula would be 100 lb 80% cream, 6 lb non-fat dry milk (NFDM) and 31 lb sucrose.)

Since the composition of concentrated sweetened cream has not been standardized, a manufacturer can adjust his formulation to the desired viscosity as well as vary the processing steps. Work is under way to obtain precise information on the influence of these latter factors on the viscosity of concentrated sweetened cream.

If reliance for the desired viscosity is placed on the level of s.n.f., crystallization of lactose with excessive graininess might result. This would not be a defect if the concentrated sweetened cream were used in the making of ice-cream, because the crystals would dissolve in the mix. If it were an obstacle to acceptance of the product, other means of controlling the viscosity would have to be used.

When concentrated sweetened cream of 20% moisture content contains 8% or less s.n.f., lactose may crystallize during unrefrigerated storage, particularly when storage is of long duration. Of course, when the s.n.f. content is higher than about 8% and the temperature is lower than 21°C, or thereabouts, there is an even greater tendency for the lactose to crystallize and cause the product to be described as gritty, grainy or sandy. If the tendency to become grainy is eliminated by reducing the s.n.f. to below 8%, de emulsification or stratification of insoluble solids will have to be prevented by some suitable means.

One recourse is to homogenize the concentrated sweetened cream, another is to heat it and a third possibility is to use a combination of homogenization and heat, although even a low homogenizing pressure, such as 500 lb/sq. in. may suffice. This should be applied to the pasteurized mixture of cream, s.n.f. and sucrose, because homogenization of heavy cream destabilizes the emulsion, and homogenization of a mixture of cream and sucrose *only* has little effect on its viscosity.

A formula used by Tamsma & Bell in making concentrated sweetened cream was 100 lb of 65% cream, 53 lb of sucrose and 10 lb of NFDM. This is a simple and practical formula—one which most dairies could use with a minimum of equipment and expense. The sucrose and NFDM are mixed and then stirred into the hot cream. After

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thorough dispersion the mixture is pasteurized, for example, by holding it at 93°C for 15 sec, cooled and packaged.

There are other ways to formulate the product, such as the use of cream of higher fat content and highly concentrated skim milk instead of NFDM. This has the disadvantages that a perishable product is the source of s.n.f. and it brings extra water into the mixture. The more water there is in the mixture of cream and s.n.f., the more sucrose is needed to attain the necessary 60–65% sugar-in-water and the lower the maximum attainable fat content becomes.

#### FLAVOUR AND BODY

Although the factors that affect the flavour and body of this new product have not been studied extensively, enough is known to justify the conclusion that flavour is of greater importance than body. If the flavour is not satisfactory, the concentrated sweetened cream will have relatively little value, whereas a sub-standard body may be only a minor inconvenience, as in the making of ice-cream. In any event, the body of the material when fresh and after long storage can be varied over a wide range. On the other hand, special precautions may have to be taken to retain a satisfactory flavour. These include not only the use of high-grade and otherwise suitable materials, but also good housekeeping practices, as severe pasteurizing conditions as the product will stand without being adversely affected, de-aerating, and packaging with a minimum residue of air and storing under some refrigeration such as 10°–15°C. The latter is, perhaps, the most important single factor in the preservation of concentrated sweetened cream, because the product is much more stable at 10°C than at 25°C. At 10°C the satisfactory life of the product relative to flavour may be twice as long as at 25°C.

#### PACKAGING AND STORAGE

During the experimental development of concentrated sweetened cream it has kept well in cans from which air was evacuated before sealing. However, packaging of the product has not been worked out on a commercial basis. Since mould contamination is always a possibility under plant conditions and concentrated sweetened cream will support mould growth when sufficient oxygen is available for their needs, it is necessary to take this into consideration when packaging the product.

Combined with favourable processing and packaging conditions, concentrated sweetened cream will still be of good quality after 6–12 months at 5°–10°C. In contrast with frozen cream, this represents a substantial saving in refrigeration costs.

#### UTILIZATION

The most obvious use for concentrated sweetened cream is in the making of ice-cream. The product takes added flavours well, such as orange, lemon and nut, without masking them. Caramelization (heating at 115°C for 1.5 h) gives a pleasing butter-scotch flavour. Homogenized concentrated sweetened cream can be whipped or diluted with milk and used on breakfast cereals and in coffee and tea.

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In the United States many soft ice-cream makers use cream and condensed skim milk which is delivered to them frequently. The manufacture of concentrated sweetened cream presents the possibility that these operators can be serviced less often and delivery costs reduced accordingly.

#### REFERENCE

- (1) Tamsma, A. & Bell, R. W. (1957) *Proc. 53rd Annual Convention. Int. Assoc. Ice Cream Mgrs., Prod. and Lab. Council* 2

#### SUMMARY

A pasteurized-milk product is described that contains about 30–60% milk-fat, 5–10% milk s.n.f., and a 60–65% solution of sucrose in the water phase to prevent fermentation. Usual ingredients are high-fat cream, sucrose and non-fat dry milk.

When properly prepared and packaged this product, concentrated sweetened cream, is marked by economy of storage, since it keeps satisfactorily at 10°C for many months. It can be transported long distances without refrigeration. Most obvious use is in the making of ice-cream and other frozen desserts. Other potential uses are in the making of cake frostings and candy and as a source of cream on cereals and in coffee and tea.

#### CREME CONCENTREE SUCREE—UNE METHODE SIMPLE ET ECONOMIQUE DE CONSERVER LES MATIERES GRASSES DU LAIT

##### RESUME

On décrit un produit de lait pasteurisé qui contient environ 30–60% de matières grasses du lait, 5–10% de matières maigres du lait, et, sous sa forme liquide, une solution de 60–65% de saccharose destinée à empêcher la fermentation. Les ingrédients habituels consistent en crème très grasse, en saccharose et en lait maigre en poudre.

Lorsqu'il est préparé et mis en boîte comme il convient, ce produit, c'est à dire de la crème concentrée sucrée, présente une économie d'emménagement considérable car il se conserve d'une manière satisfaisante pendant plusieurs mois à une température de 10°C. On peut le transporter à de longues distances sans le réfrigérer. Il se prête surtout à la fabrication de la crème à la glace et d'autres desserts congelés. On peut aussi s'en servir pour glacer les gâteaux et pour préparer des bonbons. Ce produit peut être employé comme crème pour les céréales, le café et le thé.

#### KONZENTRIERTE GESÜSSTE SAHNE—EINE EINFACHE UND SPARSAME METHODE MILCHFETTE ZU PRASERVIEREN

##### ZUSAMMENFASSUNG

Die Beschreibung ist über ein pasteurisiertes Milcherzeugnis, das 30–60% MilCHFette enthält, 5–10% nichtfette feste Milchkörper, und eine 60–65%ige Lösung von Sucrose in der Wasserphase, um Gärung zu verhindern. Ungewöhnliche Bestandteile sind hoch fetthaltige Sahne, Sucrose und nichtfette trockene Milch.

Dieses Produkt von konzentrierter gesüßter Sahne, wenn richtig zubereitet und verpackt, zeichnet sich durch Sparsamkeit an Lagerungsraum aus, da es sich befriedigend durch viele Monate hindurch in 10°C hält. Es kann auf langen Strecken ohne Eiskühlung transportiert werden. Die augenfälligste Verwendung ist in der Herstellung von Speiseeis und anderem gefrorenem Nachtisch. Andere mögliche Verwendungen bestehen in der Herstellung von Kuchenglasuren und Bonbons und als eine Quelle für Sahnen auf Mehlspeisen und in Kaffee und Tee.